



Castilleja linariifolia

Castilleja

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Sunrise lights the Oregon Buttes in the Jack Morrow Hills region of Wyoming's Red Desert. Photo by Dave Showalter

Above: Sagebrush sea (From: Showalter, D. 2015. *Sage Spirit: The American West at a Crossroads*. Mountaineers Books, Seattle, WA); reprinted with permission of photographer and publisher.

stands on fine-textured soils were more prone to mortality.

Why are results important?

1. This study addresses a small portion of the Wyoming Basins Ecoregion. However, the iconic big sagebrush (*Artemisia tridentata*) dominates the most widespread ecosystem in Wyoming (Knight et al. 2014)
2. Drought-related mortality reports for shrubs such as sagebrush are rare.
3. Landscape-wide mortality reports for shrubs are rare.
4. Results reflect interactions between extreme events ...and the importance of soils in determining local variation in the vulnerability of sagebrush to extreme events.

Big Sagebrush Die-off in Southwestern Wyoming: the rest of the story

Rumors of unprecedented die-off for big sagebrush (*Artemisia tridentata*) stands in Wyoming started circulating in 2013 as a possible consequence of 2012-13 drought conditions. *Real life is rarely so simple*. A new article in *Ecology* (Renne et al. 2019) documented the die-off event and ran a battery of climate data through the grist mill of analysis in combination with other environmental and vegetation structure data.

Results are at least a preliminary indication that the high temperatures associated with the 2012-13 drought were historic highs that contributed to drought mortality, compounded by the extremely high precipitation in September 2013 that abruptly ended the drought. The effects of drought alone were greatest in high density stands, and the compounding effects of drought+saturated soils were greatest in low density stands. ...And no matter the density,

References

- Knight, D.H., G.P. Jones, W.A. Reiners and W.H. Romme. 2014. *Mountains and Plains - The Ecology of Wyoming Landscapes*. 2nd ed. Yale University Press, New Haven, CT.
- Renne, R. R., D. R. Schlaepfer, K. A. Palmquist, J. B. Bradford, I. C. Burke and W. K. Lauenroth. 2019. Soil and stand structure explain shrub mortality patterns following global change-type drought and extreme precipitation. First published: 11 Sept 2019; <https://doi.org/10.1002/ecy.2889>

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WYNPS News

WYNPS endorses Botany Bill: The WYNPS Board voted unanimously to endorse the Botany Bill aimed to elevate use of native plants, train and employ botanists in the federal government, and fund research.

The decision was reached by written vote of the Board in the absence of a meeting, thereby placing WYNPS among the ranks of professional and public organizations including a host of other state native plant societies, the American Society of Plant Taxonomists and the Botanical Society of America supporting this bill. Further information about this initiative is posted at: <https://botanybill.weebly.com/>.

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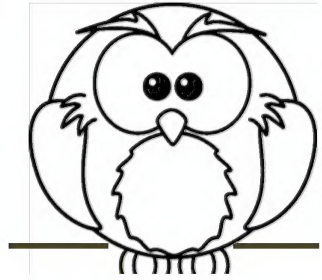
Call for Nominations:

Are YOU interested in joining the Wyoming Native Plant Society Board?

Nominations and volunteers are invited - please send your name to wynps@wynps.org or contact the Secretary/Treasurer. The deadline is 22 Nov.



Message from the President



Greetings!

Back-to-back cold fronts in early September finally convinced me that fall has indeed descended upon Wyoming, at least the northwestern corner of the state. Just a few asters, goldenrods and an occasional harebell still bloom in much of Yellowstone NP, although higher elevations will have some wildflowers till buried by snow.

Splashes of fall color have replaced the delicate beauty of spring and summer wildflowers, something of a consolation for the cessation of flowering. Fascinating physiology causes color change, while the end result provides many photo opportunities. Fall hikes and drives in northwestern Wyoming offer vivid hues of ground-hugging plants, shrubs and the occasional deciduous trees. Among my favorites are the maroon leaves of red-osier dogwood, lemon yellow aspens and spreading dogbane, and various shades of salmon and rusty-red in birch-leaf spirea and ninebark. Distinctive fall color of specific plants makes identification and reading of the landscape possible from a distance, even while driving.

The last display of colors, along with the rain and snow of fall and winter that will nourish the spectacular natural gardens of Wyoming, serves to remind me to always be grateful for and protective of native plants and their habitats.

I am still so disappointed to miss our annual meeting in my recovery from a fractured femur.

Thank you to everyone who organized and participated in the meeting!!

~Katy Duffy

Contributors to this Issue: Robert Dorn, Katy Duffy, Bonnie Heidel, Lynn Stewart.

Next Issue: Please send articles and announcements by 15 Nov to bheidel@uwyo.edu or to:

Wyoming Native Plant Society
P.O. Box 2449
Laramie, WY 82073



Photos by Lynn Stewart

- a. Excitement exploring plants,... even after sunset!
- b. Listening to a plant rebel (John Mionczynski: The Ancient People of South Pass, and Their Plants)
- c. Staring down the spine of the continent in Wyoming (View from Oregon Buttes east to Continental Peak)
- d. Soaking up insight from experts
- e. Discovering wetland oases (Oregon Buttes)

RM as *Flora of North America* Cornerstone

[Reprinted from RM Friends Newsletter 5(1), posted at: <http://www.uwyo.edu/botany/rm-friends/>]

The Flora of North America (FNA) is a wonder to behold and a remarkable work-in-progress. It started as little more than a New World dream, spurred by the start of Flora Europaea in 1960. It is a groundbreaking botanical series and collaborative effort of researchers at more than 30 U.S. and Canadian institutions. The first volume was published in 1993, launching a 30-volume magnum opus goal on the flora of a continent north of Mexico. Twenty more volumes have been published, announced with limited fanfare, emerging as though by magic. Nine more volumes are underway.

The Rocky Mountain Herbarium (RM) is an FNA cornerstone in providing specimens and specimen data, housing a major type specimen collection, and as home turf for leading researchers including Aven Nelson and Ronald Hartman. There is an FNA Editorial Committee that sets policy, priorities and participation. This included Ronald Hartman starting with Volume 1. He was also a taxonomic author, taxonomic editor, and regional reviewer for FNA.

RM continues to anchor regional FNA reviews. B. E. "Ernie" Nelson orchestrates all specimen loans and returns and is point of contact for all FNA authors, while directing RM growth and operations. Draft manuscripts for each genus get sent out to one or more regional review teams covering the distribution of the genus. The Rocky Mountain Region review team includes botanists in Colorado, Idaho, Montana, Utah and Wyoming...including Ernie Nelson! Regional reviewers take the new taxonomic treatise out for a "test drive", checking to make sure the taxonomic keys work, the distribution information is accurate, and the content is consistent with species information at state and regional levels. Bonnie Heidel, Wyoming Natural Diversity Database, compiles the seven reviews into one for the region.

The simplest kind of regional reviews are the ones that only need fine-tuning, such as the recent *Asclepias* (milkweed) manuscript. There are 77 species of *Asclepias* in North America (about 400 in the world) and 249 pages of text written about the North American ones (double-spaced)! Less than half of the 77 species occur in Rocky Mountain states – 27 to be exact, including 12 for Wyoming. In the pages of terse technical jargon, the author's insight and excitement comes across in highlighting uniqueness of species in this special genus.

The author of the *Asclepias* treatment worked closely with RM information and had already bundled the information needed to put the perplexing milkweed flora of Wyoming into perfect perspective consistent with interpretations and oversight of Wyoming experts. Three of our milkweed species haven't been seen in over 50 years, including *Asclepias uncialis* (dwarf milkweed) collected in 1873 with vague location information.



Dwarf milkweed specimen
(Osterhout 1021
RM; an 1896 coll.
from Windsor,
CO)

A mere 33 comments and notes were bundled into a review of the *Asclepias* tome for Rocky Mountain states. It included comments that the range of characteristics for a given species needed to be edited because they were too narrow for specimen material from one or more states, or that there were minor inconsistencies between the key and species description information.

Flora of North America is not just a publication treatise but a new construct in top-down and bottom-up information exchange between botanists across the continent. RM, as a herbarium of regional stature and exceptional research activity, is a cornerstone in the construct and processes for FNA. Further information about FNA is posted on the homepage: http://beta.floranorthamerica.org/Main_Page.

NEWEST FNA VOLUME

The long-awaited *Flora of North American Volume 17* is now available from Oxford University Press (\$95 + shipping): <https://global.oup.com/academic/content/series/f/flora-of-north-america-fna/?cc=us&lang=en&>. It covers Magnoliophyta: Tetrachondraceae to Orobanchaceae. Translation: THIS is the volume with dismemberment of the Figwort Family (Scrophulariaceae). The *Penstemon* genus is now in the Plantain Family (Plantaginaceae), and the Wyoming state flower (*Castilleja linariifolia*) is now in the Broomrape Family (Orobanchaceae). Volume 17 contains the works of 53 authors covering 95 genera.



Honoring Dennis Knight for Biodiversity Science Contributions

Dennis H. Knight will receive the Biodiversity Science Award on November 8 of the University of Wyoming Biodiversity Institute. The Awards Ceremony is at 6 pm, preceded by a Meet & Greet at 5:30 pm, and followed by a Reception at 7:15 pm in the University of Wyoming Berry Biodiversity Conservation Center, 10th & Lewis St., Laramie.

Knight is a prominent emeritus ecologist on state, regional and national stages in the U-WY Botany Department. His research lays a foundation for understanding the panorama of processes and patterns that give depth to composition rosters, and is a platform for understanding Rocky Mountain vegetation and biodiversity in the broadest sense.

His book, *Mountains and Plains* (Knight et al. 2014), is an extraordinary vegetation treatise with no parallel in the state or beyond. In it, he describes Wyoming's diverse vegetation, scales of organization and dynamics that serves technical audiences across botanical and zoological disciplines, as well as land managers and general public. Wyoming has benefited from the breadth of his ecological expertise, i.e., biodiversity at the landscape level. He has an amazing tendency to think (and work) outside the box, excelling as a biodiversity bridge-builder in many appointments and advisory council positions. Knight has made biodiversity science accessible to natural resource managers and the general public, while mentoring a generation of ecologists who have become leaders in their own right. bh



Announcing:

International Conference on High Elevation 5-Needle Pines

The Whitebark Pine Ecosystem Foundation (WPEF) announces an upcoming international conference on the Research and Management of High Elevation Five Needle Pines in Western North American to be held next year on September 15-17, 2020 in Missoula MT.



Forest managers, researchers, advocates and the public are invited to attend this important event! Registration and presentation submissions will begin in February 2020. Visit the conference website at

www.highfivepines.org for details on presenting your paper or poster, becoming a sponsor, volunteering, or attending.

Many high-elevation 5-needle pine forests are declining throughout North America. The conference will focus on six species of great ecological and symbolic importance to both the U.S. and Canada:

- Whitebark pine (*Pinus albicaulis* Engelm.)
- Limber pine (*P. flexilis* James)
- Southwestern white pine (*P. strobiformis* Engelm.)
- Great Basin bristlecone pine (*P. longaeva* D.K. Bailey)
- Rocky Mountain bristlecone pine (*P. aristata* Engelm.)

The event will bring together scientists, managers, and concerned citizens to exchange information on the ecology, threats, and management of these important pines; describe efforts to mitigate threats through restoration techniques and action plans; and, build a foundation for the synthesizing this work. MNPS



WYOMING RARE PLANT FIELD GUIDE:
It's B-A-A-A-C-K-K-K!

By Bonnie Heidel, WYNDD

The Wyoming Rare Plant Field Guide, affectionately known as the "Red Book" (Fertig et al. 1994) was the first and only attempt at starting a statewide, interagency publication on the rare plants of the state. Fortunately for Wyoming botanists, it never went away (copies are still available!). Starting in 1998, the text and images were expanded in posted pdf files called species abstracts. Fast-forward to 2019...

Starting right now, the Wyoming Field Guide is back as an online "living document" currently treating all Wyoming plant species of concern or potential concern (423 and 48 spp., respectively or 471 total; Heidel 2018). The text and images accumulated by Wyoming Natural Diversity Database (WYNDD) in intervening years are finally seeing the light of day, or rather, a new digital dawn. Long in the making, it is not an apparition. The URL is: <http://fieldguide.wyndd.org/> - you might want to bookmark it!

The current species-by-species information sets are referred to as individual species accounts, collectively posted in the WYNDD Wyoming Field Guide. They draw directly from WYNDD data and are only a click away from printing your own personal field guide.

Ninety-two rare plants were featured in the Red Book, less than 25% of the rare plants at that time. The plant species abstracts covered about 206 rare plants (including the 92 Red Book species). What has happened to the original 92 plant species in the 25 years since?!? In various cases, some among them are now:

- Listed as Endangered or Threatened (few)
- Documented as more common than previously known to the point that they are no longer considered rare in the state (many)
- Designated as Sensitive by Bureau of Land Management of Wyoming; or by U.S. Forest Service in regional office designations (select)
- Going by new scientific name aliases (many!)
- No longer recognized as taxonomically valid or distinct (just a couple cases)
- Still on a Wyoming list of Missing in Action (State Rank = SH [Historical], i.e., not known from any living populations)
- Taken off the prior Wyoming list of Missing in Action (rediscovered!)

All of the changes above are ample material for a conservation mystery novel or a botanical soap opera. [Look for future newsletter installments!]

Meanwhile, the Red Book has valuable graphics and text, including a highlight of diagnostic characteristics. It has succinct habitat descriptions. It still has use in the field. The advantage of the posted Wyoming plant species accounts are that they are a common platform for the botany community at-large to access complete rare species coverage, with compiled survey results, revisionary taxonomic research, accompanying documentation, and status context for almost 500 species.

Wyoming plant species accounts are a statewide, interagency resource in a new **digital** Field Guide portal. They replace one-time publications to provide current information at your fingertips, a running synthesis of new and old data and graphics. Contents are covered on the following page.

WY PLANT SPECIES ACCOUNT CONTENTS

- Taxonomic relations (hierarchy of classification from the Kingdom to the finest accepted Species or Variety levels)
- Scientific and common names (following the RM checklist for the former and the PLANTS database – mostly – for the latter). We also include cross-reference to previously-used names and abilities to search on them
- Ranks under the NatureServe system of global and state ranks
- Status under U.S. Fish & Wildlife Service determinations, and federal land-managing agency designations
- Description information (terse text for making positive determination in comparison with other species in the state, also noting phenology, and salient identification references)
- A set of graphics that usually includes at least three things: black-and-white illustration, whole plant photo, close-up photo of flower or other diagnostic part¹
- Distribution information (including rangewide and statewide)
- “Live” distribution map showing all known locations (that are known to within a mi radius) at the scale of a township.
- Habitat information (including rangewide and statewide)
- A set of photographs that show species’ habitat at any of three scales: landscape, vegetation structure, or microhabitat features.
- Number of statewide occurrences (populations),
- Abundance in the state
- Trends in the state
- Protection status of places where it grows
- Threats

- Public lands (namely, federal public lands) where present
- Contributors represent the authorship of each plant species account in its evolution and update
- References that include all citations in the preceding species account text, ...plus recognition of all formal studies such as floristic inventory masters theses that expanded the distribution for a given species, ...plus additional sources that might help aid in identification of a given species (but not cited among the primary sources in the species description text)

Comments and questions are welcome any time! Please direct them to: bheidel@uwyo.edu. The system is not without inconsistencies and glitches – bear with us. ...*At least we don’t have to start over!*

The initiative, knowledge and assorted superhuman skills brought to the Red Book and its successors by Walter Fertig is acknowledged with gratitude. Important abstract contributions were made by Stuart Markow, Kevin O’Dea, Jennifer Whipple and Stephanie Mills. Joy Handley was a vital ongoing contributor to species abstracts and accounts. Melanie Arnett posted species abstract pdf files for years, and more recently, orchestrated the majority of the database import/export work needed to transfer information from the species abstract system to a new species account system, as well as updates to nomenclature. Mark Andersen was at the hub of data coordination and programming contracts for the online system covering both plant and animal species accounts.

Last but not least, the Bureau of Land Management provided foundation support at all three stages, augmented by U.S. Forest Service support.

References

- Fertig, W., C. Refsdal, and J. Whipple. 1994. Wyoming Rare Plant Field Guide. Wyoming Rare Plant Technical Committee, Cheyenne, WY.
- Heidel, B. 2018. Wyoming plant species of concern. Wyoming Natural Diversity Database, Laramie, WY.

¹ As of this writing, photographs and illustrations have only been loaded for about 43 species. - - Expect more!

Growing Native Plants

Part 33. Rock Garden Plants

By Robert Dorn

Plants suitable for rock gardens typically flower in spring and early summer and then become semi-dormant for the rest of the growing season. This is the result of their shallow, rocky soils and the tapering off of precipitation through the summer. If the plants are given occasional extra water, they will usually remain green. Their growth form may be attractive even without flowers.

Oxytropis multiceps, Flowery Locoweed, is a compact perennial to 3 inches tall forming small mats. The leaves are all basal, to 3 inches long, and pinnately compound with 5 to 9 leaflets. The flowers are pink-purple, to 1 inch long with 2 to 4 per stem, the many stems producing a dense mound of flowers. They appear from April to June. The plants occur naturally in dry gravelly places in the plains, basins, and foothills. They prefer full sun and dry, well drained soils. They are easily grown from seed which has been scarified. Seed is commercially available.



Oxytropis multiceps, Laramie County

Phlox muscoides, Moss Phlox, is a densely matted perennial to about 3 inches tall. The leaves are about 0.5 inch or less long and are densely crowded on the very short stems. The flowers are white, to 0.5 inch across, and often nearly covering the mat. They appear in May and June. The plants occur naturally on rocky limestone ridges and slopes. They prefer full

sun and dry, rocky, limey soils. They can be grown from seed surface sown outdoors in the fall.



Phlox muscoides, Fremont County

Artemisia capitata (*Sphaeromeria capitata*), Rock sagebrush, is a matted perennial to 8 inches tall, the mats as much as 2 feet across with several to many flower stems per plant. The leaves are gray-green, deeply divided at the tip, to 1.5 inches long, and mostly basal. The flowers are yellow and in dense heads about 0.5 inch across at the tips of the stems. They appear in May and June. The plants occur naturally on dry, rocky hills, usually on limestone, in the basins. They prefer full sun and dry, well drained, limey soils. They are easily grown from fresh seed.



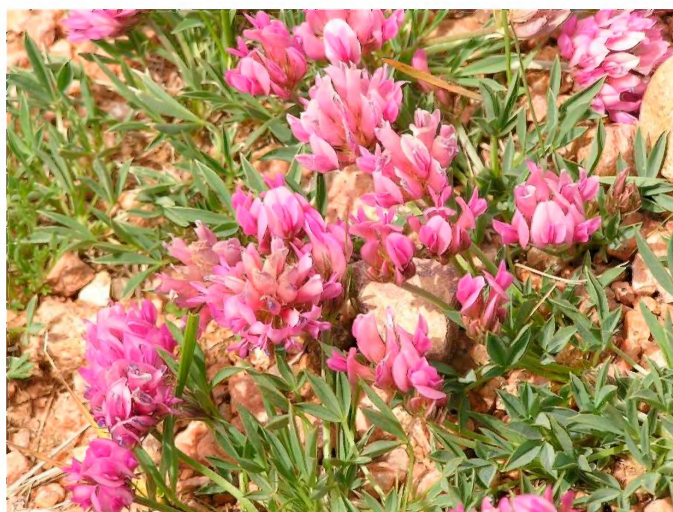
Artemisia capitata, Fremont Co.

Tetraneuris torreyana, Torrey Tetraneuris, is a low growing perennial to 8 inches tall with several stems per plant. The leaves are basal or nearly so, narrow, and to 4 inches long. The ray and disk flowers are yellow, the heads to 2 inches across which are borne singly at the stem tips. They appear from April to June. The plants occur naturally on rocky hills and ridges, often on limestone, in the plains, basins, and foothills. They prefer full sun and dry, well-drained, limey soils. They can be grown from seed. Cover lightly with soil to allow some light exposure.



Tetraneuris torreyana, Uintah Co., UT

Trifolium dasyphyllum, Thicketleaf Clover, is a low growing perennial to 8 inches tall and forms loose mats. The leaves are basal or nearly so and divided into 3 narrow leaflets each to 2 inches or less long. The flowers are rose-purple or pink-purple to purple, to 0.75 inch long, and clustered in tight heads to 1.5 inches across that barely if at all exceed the leaves. They appear from June to August depending on elevation. The plants occur naturally in open, often gravelly places in the mountains. They prefer full sun and moist, well drained soils. They can be grown from seed. Scarify the seed before planting.



Trifolium dasyphyllum, Albany Co.

To see the above plants in color, go to the newsletter on the Society website.

Autumn Glory¹

Red osier dogwood (*Cornus sericea*) comes into its own in autumn. After the growing season's succession of colors, we are finally able to see its vibrant red stems that were with us all along. It lends its intense color to rivers across the state, from the Absarokas and Black Hills to Pine Mountain and Pole Mountain near southern borders.

Look for its flat-topped clusters of white flowers in June, followed by white or bluish berries later in summer and dark green leaves that turn a pale red, readily blow away to reveal its autumn glory. This many-stemmed shrub usually grows 5 to 15 feet tall. I say *usually* because it is savored by moose.

The easiest way to tell if moose live nearby is by the presence of short, browsed red osier dogwoods that look like they've been attacked in overzealous hedge trimming. Such telltale signs are found in places in the Big Horn Mountains. (Continued, p. 10)

¹ Geographically recalibrated from an *Independent Record* article (Helena, MT) written by Bonnie Heidel over 20 years ago, part of a weekly native plant series that ran in the paper by local chapter members of the Montana Native Plant Society.

Cont. from p. 9

As of this writing, red osier dogwood has endured some heavy-duty trimming at Cheyenne Botanic Gardens. It is a favorite landscaping shrub for its autumn color. It thrives in moist or well-watered settings. The cultivated varieties of this native species have been selected by horticulturalists from plants in the wild for specific colors, growth forms and climate adaptations.

Red osier is a true dogwood, but it grows wild in the same settings as willows. This is the basis for the "red willow" name given to it in Lakota and other Native American languages. Similarly, "osier" refers to the pliable willow traditionally used for furniture and basketry. Its red osier name can be paraphrased as "red willow." In addition, it was also one of several plants referred to as "kinnickinnick" for its use in smoking tobacco mixtures.

The epithet *Cornus stolonifera* appeared in earlier Wyoming floras, referring to the low-spreading branches that resemble "stolons" (stems that creep on the ground) sprouting new branches. This same sprouting vigor may help heal Togowotee Pass rights-of-way where the highway was re-contoured skirting headwaters.

...By whatever name or namelessness you know it,
I wish you autumn days with a river etched in red osier.

Wyoming Native Plant Society is a non-profit organization established in 1981 to encourage the appreciation and conservation of the native plants and plant communities of Wyoming. The Society promotes education and research through its newsletter, field trips, annual student scholarship and small grants awards. Membership is open to individuals, families, or organizations. To join or renew, please return this form to:

Wyoming Native Plant Society
P.O. Box 2449
Laramie, WY 82073

Name: _____

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Check one: ☐ New member ☐ Renewing member

☐ Renewing members, check here if this is an address change.

☐ Check here if you prefer to receive the newsletter electronically

Membership

☐ WYNPS annual membership: \$10.00

☐ WYNPS annual membership + scholarship support: \$20.00
(\$10.00 for membership and \$10.00 for Scholarship fund)

☐ WYNPS Lifetime membership: \$300 (\$150 for membership and \$150 for Scholarship fund)

☐ Sublette Chapter annual membership: \$5.00

☐ Teton Chapter annual membership: \$5.00

Total enclosed: _____ THANK YOU!

Wyoming Native Plant Society
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